DEVELOP AND DESIGN SHEMATIC DIAGRAM AND MECHANISM ON ONE SEATER DRAG BUGGY

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SUPERVISOR'S DECLARATION

We hereby declare that we have checked this project and in our opinion this project is satisfactory in terms of scope and quality for the award of the degree of Diploma of Mechanical Engineering

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Position: Instructor Engineer
Date:

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature: …….
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The lastly I want to acknowledge my sincere indebtedness and gratitude to my parent and siblings. I cannot find appropriate words that could properly describe for their devotion, support, faith my ability to attain my goal.

ABSTRACT

Development Buggy one seater is project continued from idea Mr Fazli and Mr Wong. The Buggy chassis is already finished by Mr faizul and I need upgrade or create transmission linkage the complete their system. Project need need to continue to make sure a Buggy finish until it can move and drive. The project also involves design and fabrication a rear engine transmission system by concerning the aspect the linkage, safety and don't bother any system. The gear transmission system need to fabricate to make sure is suitable for the system. Modifications are required to improve the system. With a new concept of the linkage and mechanism, the analysis needed to approve the design. Mostly, this project is required to develop the skills in fabrication, design and testing. Whole of this project is particular involves suitable system of design and fabrication for transmission linkage and mechanism for Buggy. Diploma final year project will allocate the one semester to complete a project. This project also required the adequate student to finish a task given. The task division need to apply, for the entirely three part will be make that is a development of auxiliary system, steering system and transmission linkage system.

ABSTRAK

Pembinaan Buggy ini adalah sambungan projek idea dari En Fazli dan En Wong. Rangka Buggy yang telah siap oleh En Faizul dan saya perlu menambah lagi untuk menyempurnakan sistem yang perlu ada pada sebuah buggy itu. Projek perlu diteruskan bagi memastikan buggy siap sehingga boleh bergerak dan dipandu. Projek ini juga melibatkan reka bentuk dan membuat sistem enjin transmisi belakang dengan tumpuan laluan kabel, keselmatan dan tidak mengganggu sistem lain. Di sini sistem transmisi perlu dibangunkan untuk memastikan ia sesuai dengan sistem. Untuk memperbaiki sistem yang ada, modifikasi diperlukan. Dengan adanya konsep laluan dan “mechanism”, analisis adalah untuk membuktikan reka bentuk yang telah dicipta. Secara keseluruhan projek ini adalah untuk membina kecekapan dalam mereka, membina dan menguji. Keseluruhan projek ini adalah adalah melibatkan meraka bentuk yang sesuai bagi sistem transmisi untuk buggy. Projek tahun akhir diploma ini mempunyai tempoh satu semester untuk disiapkan. Projek ini juga melibatkan tenaga pelajar seramai tiga orang untuk menyiapkannya. Di dalam projek ini, pembahagian tugasan di[erlukan. Secara keseluruhannya, projek ini dipecahkan kepada tiga bahagian iaitu sistem “auxiliary”, sistem transmisi dan sistem pengendalian.

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CHAPTER 1

INTRODUCTION

1.1 Project Background

This project was supposed to make an Off-Road Buggy for plantation monitory such as FELDA Holding. It is design for off-road explore on plantation and extreme condition for any locations. After design fabrication has done, the buggy will be proposed to Felda Plantation (subsidiary of Felda Holding) as a collaboration project between university and government department. This project was divided into three major parts for PTA students to handle it under En. Mohd Fazli B Ismail as supervisor. The three major parts were steering system, auxiliary and transmission system for the buggy. This project is to modified and creates linkage transmission system for this buggy. Overall this project has required capability of design, knowledge and fabrication for each part in the system.

1.2 Problem Statements

The Mira engine is commonly used in front body of the chassis. But for this project, the position engine is placed at the rear chassis. So the system of transmission has change instead.

The problems statement in my parts is to create linkage transmission for the buggy that use rear engine. This project must have to solve it how the linkage from rear engine can get through to pedal acceleration, brake and clutch. The linkage that creates must not bother to any system and attach the cable from rear engine. Also these projects have

modified the 5 speed shift tick that has produce by supervisor. And now that another problem has been recognize are that extent cable create not be function. Example when cable is pull all extent cable follow but when cable is push it is do not work include the extent.

Figure 1.1: Engine at the front chassis Mira

Figure 1.2: Engine at the Rear chassis Buggy

1.3 Project Objective

The project objective is:-

a) Develop a new schematic diagram plan
b) Fabrication of transmission linkage system
c) Develop and design a Mechanism

1.4 Scope

Scopes will be discussed on subject in the Industrial Design

1) Investigation of Problem
   - In this process, the buggy have must ensure that problems.
   - Identifying latent or hidden problem at transmission for buggy.

2) Set target specifications
   - Based on transmission buggy problem and rear engine condition and position.
   - Developed flow chart.
   - Set ideal and acceptable values.

3) Conceptualization.
   - In this process, this project will concentrate creating the schematic diagram plan.
   - This project will make simple sketches known as thumbnail sketches of each concept.
   - This project also design and develop Mechanism and do analysis for the mechanism.

1.5 Project Flow Chart

This flow chart and Gantt chart that use for the set up this project from start I get this project till finish the project. This Gantt chart referred at appendix

FLOW CHART

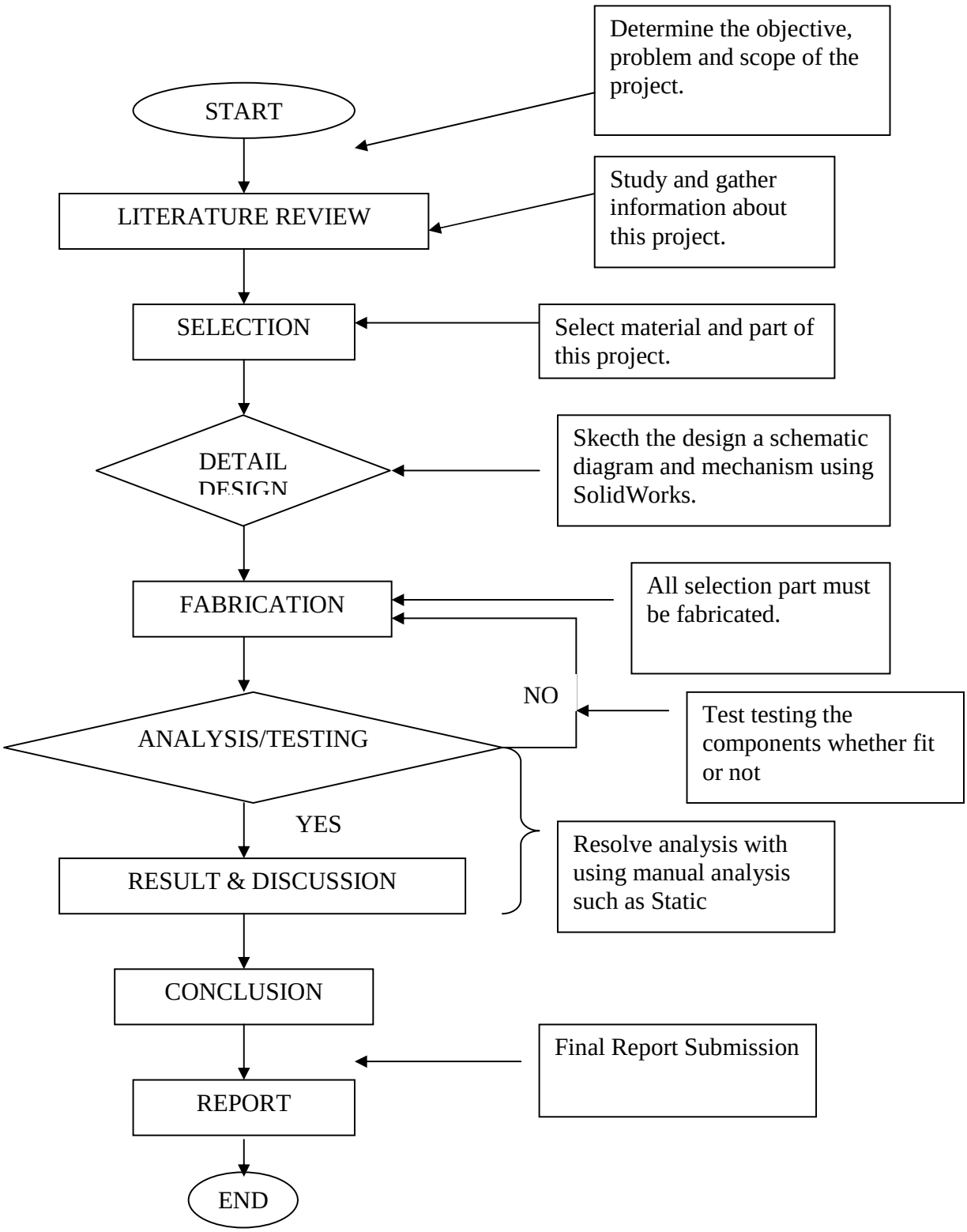


Figure 1.3: The project planning for Buggy linkage transmission.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A dune buggy is a recreational vehicle with large wheels, and wide tires, designed for use on sand dunes or beaches. The design is usually a modified vehicle with a modified engine mounted on an open chassis. The modifications usually attempt to increase the power to weight ratio by either lightening the vehicle or increasing engine power or both. They are also often referred to as air buggies, and those with an open frame chassis are called sandrails.

A similar, more recent generation of off road vehicle, often similar in appearance to a sand rail but designed for different use, is the "off road go kart". The difference between a *dune* buggy or go kart and an "off road" buggy or kart is sometimes nothing more than the type of tires fitted -sand tires or all terrain tires - but "off road" go karts and buggies are a rapidly developing category of their own. [1]

2.2 Rear-Engine Transmission System

In automobile design, a rear-engine design layout places both the engine and drive wheels at the rear of the vehicle. The center of gravity of the engine itself is actually past the rear axle. This is not to be confused with the center of gravity of the whole vehicle, as an imbalance of such proportions would make it impossible to keep the front wheels on the ground.

Rear engined cars are almost always rear wheel drive, a layout known as RR. The exception is certain high performance four wheel drive models from Porsche.

This layout is typically chosen for three reasons, packaging, traction, and ease of manufacture:

- Since the engine is located at an extremity, the rest of the vehicle can be used for passengers and luggage
- Having the engine located over the driven wheels increase downward pressure which is helpful for grip on loose surfaces
- The drivetrain can be assembled as a unit and installed easily at the factory -easier than a FF layout where the driven wheels also steer the car

The disadvantage of the rear engine configuration is that placing the engine outside the wheelbase creates significant problems for car handling as, when the car begins to slide on a corner, the end of the car will tend to want to swing wide and overtake the front — especially under braking. This tendency is referred to as oversteer and creates potential safety issues both for ordinary drivers, and even in racing applications. There are also occasions where expert drivers find such behavior desirable in drifting, a motorsport based on intentional oversteer. Details on the handling characteristics of rear engined cars were prominently featured in the 1965 book Unsafe at Any Speed.

In addition, even though the rear wheels benefit from the additional traction the added weight of the engine gives, the front wheels still need traction in order to steer the car effectively. For this reason, a rear engined car can also be prone to understeer.

Most manufacturers have abandoned the rear engined layout apart from Porsche who has gradually developed their design with improvements to the suspension as well as electronic aids to reduce the shortcomings of the layout to acceptable levels.

On the De Lorean, to compensate for the uneven (35/65) weight distribution caused by the rear-mounted engine, the car had rear wheels with a diameter slightly greater than the front wheels. [2]

Figure 2.1: Example Rear-Engine at the Car

Source: www.ritzsite.demon.nl

2.3 Automatic Transmission

An **automatic transmission** (commonly "AT" or "Auto") is an automobile gearbox that can change gear ratios automatically as the vehicle moves, freeing the driver from having to shift gears manually. Similar but larger devices are also used for heavy-duty commercial and industrial vehicles and equipment.

Most automatic transmissions have a set selection of possible gear ranges, often with a parking pawl feature that will lock the output shaft of the transmission. Continuously variable transmissions (CVTs) can change the ratios over a range rather than between set gear ratios. CVTs have been used for decades in two-wheeled scooters but have seen limited use in a few automobile models. Recently, however, CVT technology has gained greater acceptance among manufacturers and customers.

Some machines with limited speed ranges or fixed engine speeds, such as some forklift trucks and lawn mowers, only use a torque converter to provide a variable gearing of the engine to the wheels. [3]

If you have ever driven a car with an automatic transmission, then you know that there are two big differences between an automatic transmission and a manual transmission:

- There is no clutch pedal in an automatic transmission car.
- There is no gear shift in an automatic transmission car. Once you put the transmission into **drive**, everything else is automatic.

Both the automatic transmission (plus its torque converter) and a manual transmission (with its clutch) accomplish exactly the same thing, but they do it in totally different ways. It turns out that the way an automatic transmission does it is absolutely amazing!

In this article, we'll work our way through an automatic transmission. We'll start with the key to the whole system: planetary gearsets. Then we'll see how the transmission is put together, learn how the controls work and discuss some of the intricacies involved in controlling a transmission.

Just like that of a manual transmission, the automatic transmission's primary job is to allow the engine to operate in its narrow range of speeds while providing a wide range of output speeds.

Without a transmission, cars would be limited to one gear ratio, and that ratio would have to be selected to allow the car to travel at the desired top speed. If you wanted a top speed of 80 mph, then the gear ratio would be similar to third gear in most manual transmission cars.

Probably never tried driving a manual transmission car using only third gear. If you did, you'd quickly find out that you had almost no acceleration when starting out, and at high speeds, the engine would be screaming along near the red-line. A car like this would wear out very quickly and would be nearly undriveable.

So the transmission uses gears to make more effective use of the engine's torque, and to keep the engine operating at an appropriate speed.

The key difference between a manual and an automatic transmission is that the manual transmission locks and unlocks different sets of gears to the output shaft to achieve the various gear ratios, while in an automatic transmission, the same set of gears produces all of the different gear ratios. The planetary gearset is the device that makes this possible in an automatic transmission. [4]

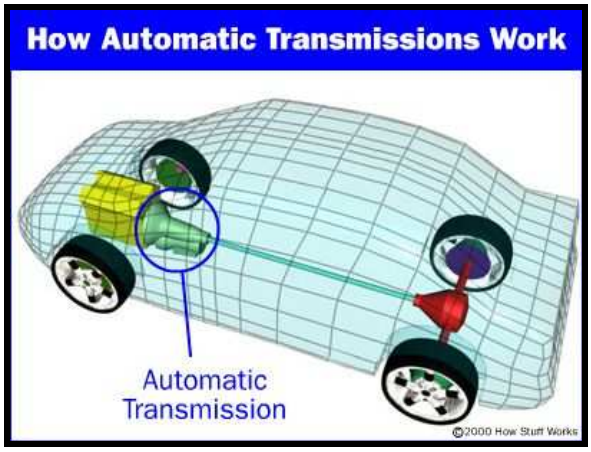


Figure 2.2: Location of the Automatic Transmission

Source: http://auto.howstuffworks.com/automatic-transmission.htm

2.4 Component

a) Engine

- An engine whose purpose is to produce kinetic energy output from a fuel source is called a prime mover
- A motor is a device which produces kinetic energy from a preprocessed "fuel" (such as electricity, a flow of hydraulic fluid or compressed air). [5]

Figure 2.3: Example Mercedes V6 Engine in 1996

Source: http://en.wikipedia.org/wiki/Engine

b) Gear shift stick

- In most modern passenger cars, gears are selected through a lever attached to the floor of the automobile—this selector is often called a gear stick, gear lever, gear selector, or simply 'shifter'. [6]

Figure 2.4: Example 5 Speed Shift Stick of a 1999 Mazda Protege

Source: http://en.wikipedia.org/wiki/Manual_transmission

c) Cable

- A flexible metal or glass wire or group of wires. All cables used in electronics are insulated with a material such as plastic or rubber. [7]

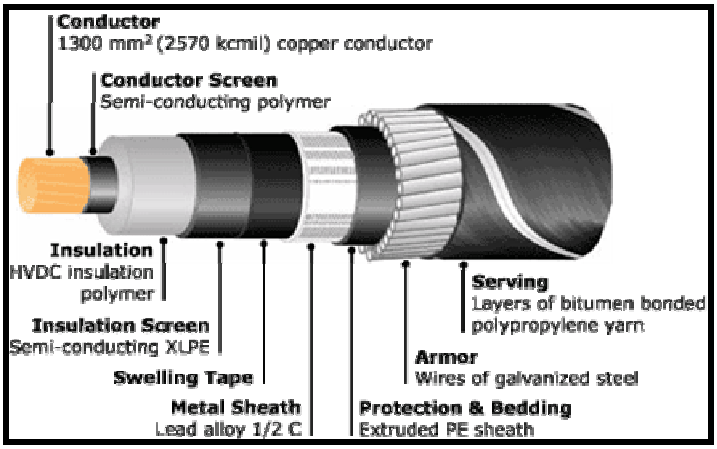


Figure 2.5: Example of Cable

Source: source: www.crosssoundcable.com

CHAPTER 3

PROJECT METHODOLOGY

3.1 Project Flow

Methodology is the method that used from early project develops until the end product release. It consist several stage of conducting this whole project. This flow will explain detail about each step of **Industrial Design Method** in developing new product that will achieve the required specification.

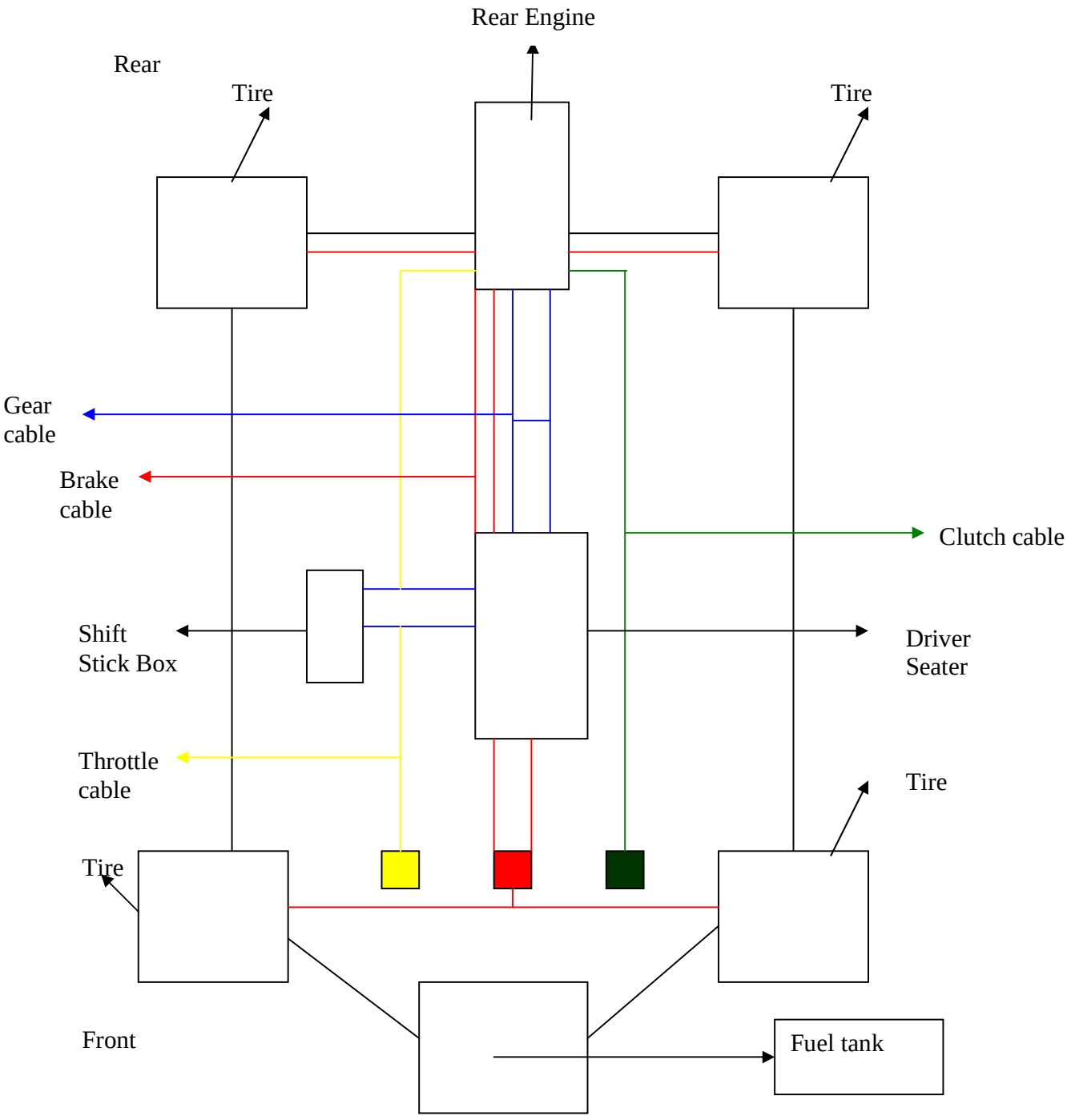
3.1.1 Problem and Part Studies

This is the first step of the flow. Which is the project had to identify the problems in the system and list down the causes of the problems. This also have to studies each part in the steering system to gain more knowledge and understanding the principal of each component.

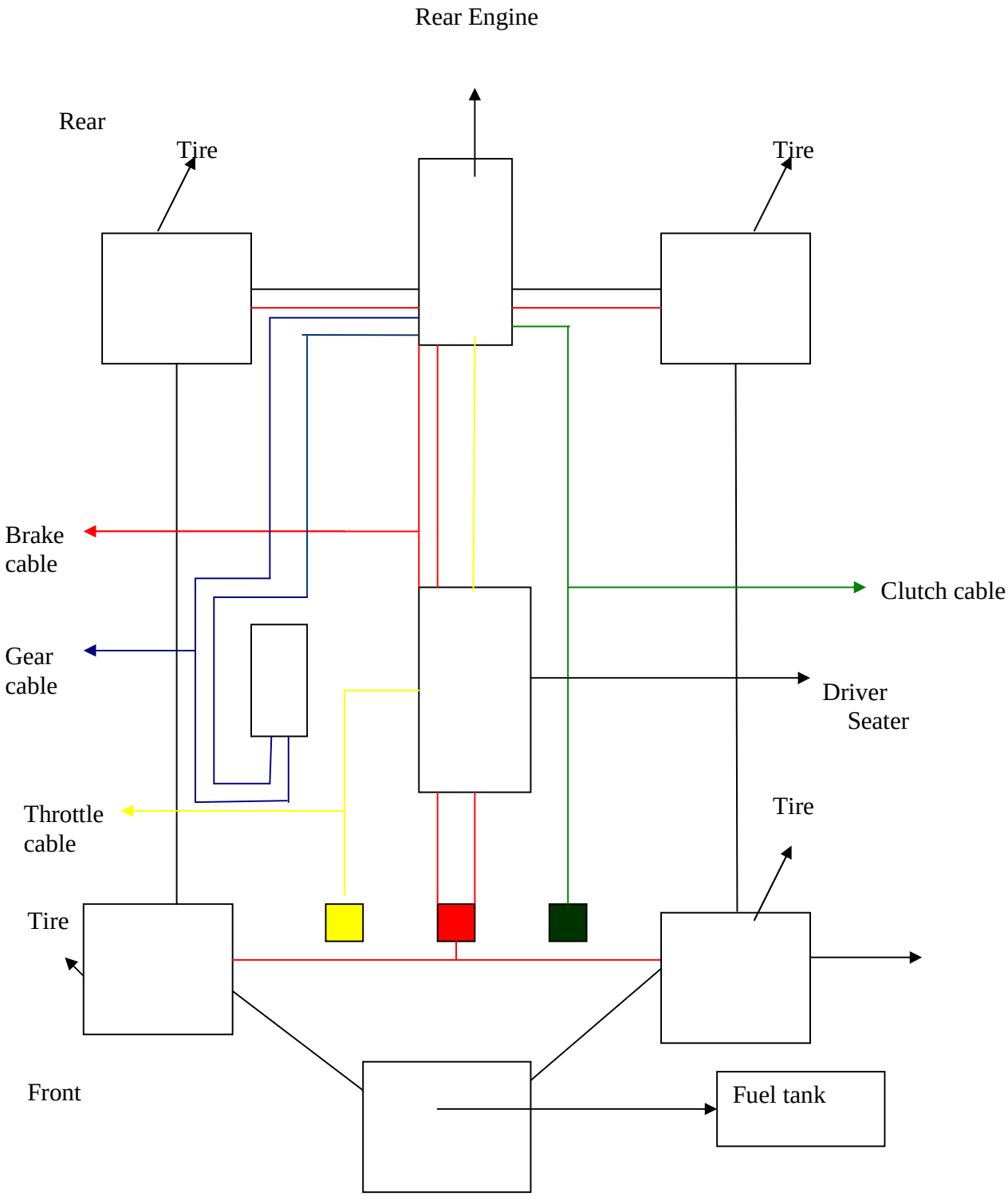
3.1.2 Designing Linkage Concept and Selection of Best Concept

This stage will need a lot of new concept to help in development of the best concept. This is because the concepts that develop from sketch are being compared by several aspects such as size, strength, material and ergonomic.

Concept A


Rear Engine
Rear
Tire
Tire
Gear
cable
Brake
cable
Clutch cable
Shift
Stick Box
Driver
Seater
Throttle
cable
Tire
Tire
Front
Fuel tank

Concept B


Rear Engine
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Tire
Tire
Brake
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Driver
Seater
Throttle
cable
Tire
Tire
Front
Fuel tank

Concept C

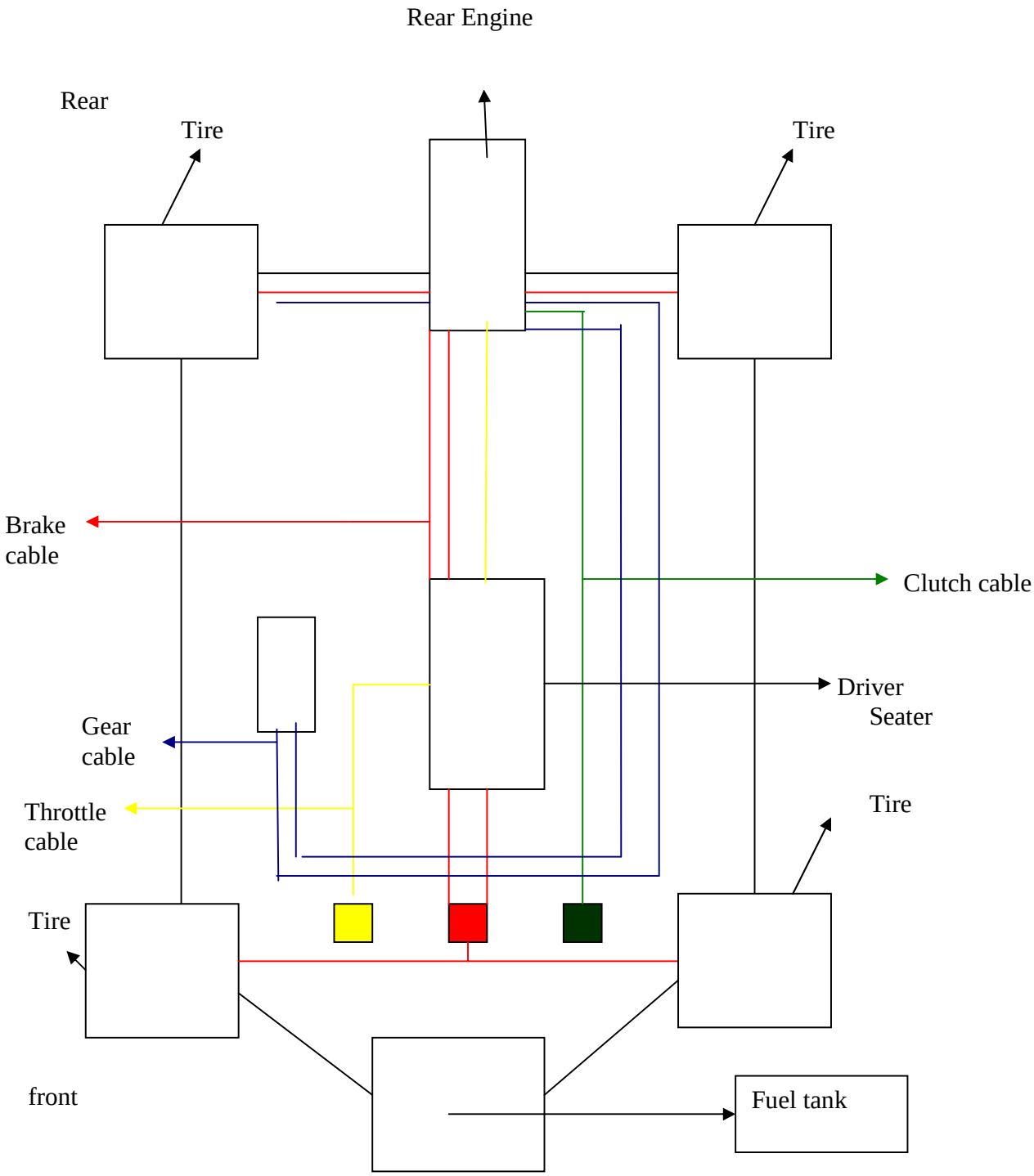
Rear Engine
Rear
Tire
Tire
Brake
cable
Clutch cable
Driver
Seater
Gear
cable
Throttle
cable
Tire
Tire
front
Fuel tank

Table 3.1: Advantage and Disadvantage Each Concept

Concepts	**Advantages**	**Disadvantage**
A	• Cost of manufacturing • Cost of maintenance • user friendly • less risk of damage exposure	• -design of position of model component are limited due to short cable • wire easily crash when accident
B	• Arrangement location	• higher risk of cable cut due to larger coverage area of cable placement on vehicle body
C	• More organize cable design	• all cable are at risk of being cut if an impact hits the cable placement body part

3.1.2.2 Concept Generation and Evaluation

Three concepts for the linkage were developed. The table below shows the evaluated against with the Pugh concept selection.

Table 3.2: Table Pugh concept

	Concept			
Selection of criteria	Concept A	Concept B	Concept C	Rear engine linkage
Ease of Maintenance	+	+	+	0
Ease of use	+	+	+	0
Handling	0	0	0	0
Power	+	+	-	0
Length	0	+	+	0
Ease to manufacture	+	-	+	0
Efficiency	+	-	+	0
Quantity of material	-	-	-	0
Strength	+	0	0	0
Pluses	6	4	5	
Same	2	2	2	
Minus	1	3	2	
Net	5	1	3	
Rank	1	3	2	

Notes:

+ = Better than - = Worse than 0 = Same as

Criteria	Concept 1	Concept 2	Concept 3	Final Concept
Lightweight	1	1	1	Concept 3
Cable strength	4	1	2	Concept 1
Variety of gear speed	4	2	3	Concept 1
Ease to manufacture	4	1	3	Concept 1
Easy to handling	4	2	1	Concept 1
Easy to use	5	3	4	Concept 1
Quantity of material	2	3	4	Concept 3
The material cost	2	4	3	Concept 2
Power and efficiency	4	2	3	Concept 1
Strength	3	4	2	Concept 2

Table 3.3: Table Metric Concept

Concept A is selected as the best concept linkage because is fulfill the required specification such as:-

- This location is suitable for mechanism for transmission
- Size which is suitable

3.1.3 Designing Mechanism

After connection all the extend cable didn't work, this project must recognize other concept which is create a new mechanism. In this stage the designing create using 3D Solidworks drawing and analyze using cosmos software to determine that mechanism that creates is suitable for this project.

3.1.3.1 Final Assemble Drawings

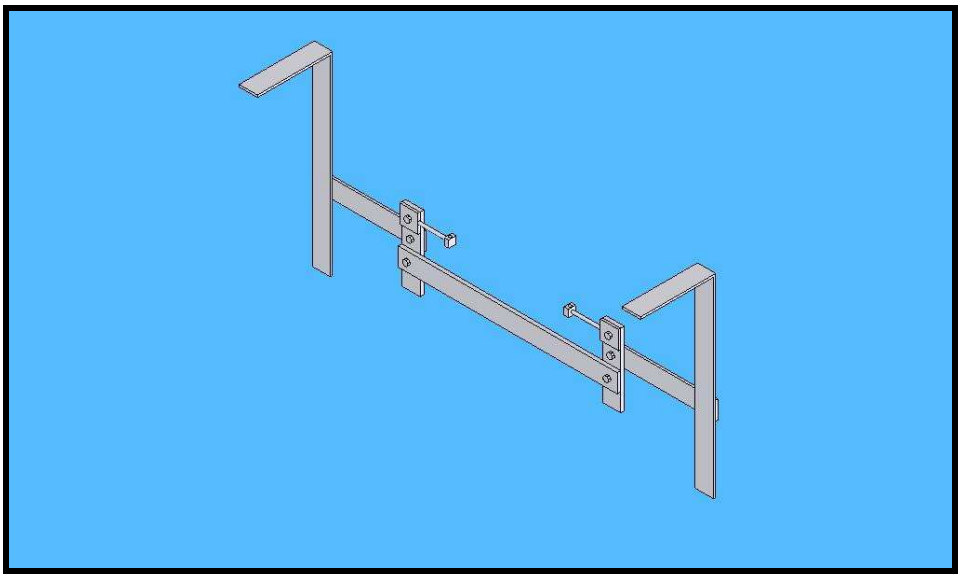

FIGURE 3.1: Mechanism Assemble View

This mechanism is connected from Engine transmission from back to Shift tick gear box. This function is allowing movement mechanism from rear engine transmission.

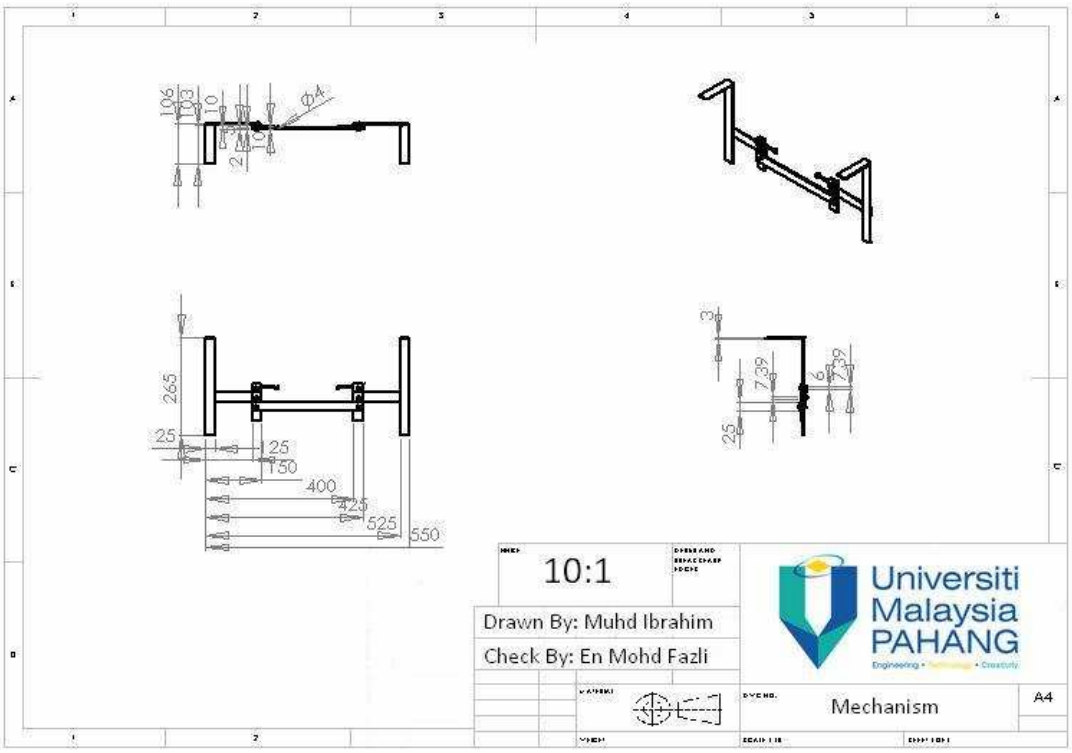

Figure 3.2: Technical Drawing Assemble View

3.1.4 Fabrication and Modification

In this stage I have to start fabricate the extent shift tick gear, cable and something that can attach cable from rear-engine the finalize concept using the selected materials.

3.2 Flow Fabrication Process

3.2.1 Type of Fabrication

This type of fabrication is consists that all the parts have design before by following all the dimension using various type of manufacturing process. These types of process are:-

a) Measuring and Making

The fabrication process is start with measuring and making the material into dimension needed.

b) Cutting Process

In this process the material needed have cut according to its length and cut again to get the length needed. This process is done using disc cutter.

Figure 3.3: Cutting Process

c) Drilling Process

This process progress is when the material has been measured and marking to drill. The hole position is measured and mark using equipment like steel ruler and steel marker. After marking the hole position, the centers of the hole is mark using hand center drill and hammer and after the holes has marked, the holes now ready to be drill.

Drilling process is done by using hand drill. The drilling process used two sized of drill bit. Firstly, small drill bit size 3 mm is used to drill all the position. This is because to reduce center positioned error while drilling. After the holes are drilled, the holes drill again using the size of drill bit 6mm. the drilling process ended when all the holes are drilled.

Figure 3.4: Drilling Process

d) Welding Process